WE CLAIM:

1. A method for increasing the level of at least one 4'-*O*-methylated isoflavonoid compound in a target plant comprising transforming said target plant with a DNA fragment comprising an isoflavone *O*-methyltransferase gene to form a transgenic plant and over-expressing said gene in said transgenic plant under the control of a suitable constitutive or inducible promoter.

2. The method of claim 1, wherein said compound is a 4'-*O*-methylated isoflavonoid phytoalexin.

3. The method of claim 1, wherein said compound is a 4'-*O*-methylated isoflavonoid nutraceutical.

4. The method of claim 1, 2 or 3, wherein said fragment comprises SEQ ID NO:1.

5. The method of claim 1, 2 or 3, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

6. A method for producing at least one 4'-*O*-methylated isoflavonoid compound in a target plant that does not produce said 4'-*O*-methylated isoflavonoid compound comprising transforming said target plant with a DNA fragment comprising an isoflavone *O*-methyltransferase gene to form a transgenic plant and expressing said isoflavone *O*-methyltransferase gene in said transgenic plant under the control of a suitable constitutive or inducible promoter, said transgenic plant containing all the other necessary enzymes of isoflavonoid biosynthesis to produce said 4'-*O*-methylated isoflavonoid compound.

7. The method of claim 6, wherein said compound is a 4'-*O*-methylated isoflavonoid phytoalexin.

8. The method of claim 6, wherein said compound is a 4'-*O*-methylated isoflavonoid nutraceutical.

9. The method of claim 6, 7 or 8, wherein the native DNA of said target plant encodes said enzymes.

10. The method of claim 6, 7 or 8, wherein said target plant is genetically transformed to encode for at least one said enzyme

11. The method of claim 9, wherein said fragment comprises SEQ ID NO:1.

12. The method of claim 9, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

13. The method of claim 10, wherein said fragment comprises SEQ ID NO:1.

14. The method of claim 10, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

15. A method for producing at least one 4'-*O*-methylated isoflavonoid nutraceutical in non-plant cell system by expression of a DNA fragment comprising an isoflavone *O*-methyltransferase gene under the control of a suitable constitutive or inducible promoter in cells that have been genetically transformed to contain all the other necessary enzymes of isoflavonoid biosynthesis to make said 4'-*O*-methylated isoflavonoid nutraceutical.

16. The method of claim 15, wherein said fragment comprises SEQ ID NO:1.

17. The method of claim 15, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

18. A method for decreasing the levels of formononetin, at least one of its conjugates or mixtures thereof in a transgenic forage legume comprising antisense expression, sense gene-mediated silencing, or nucleic acid-mediated insertional inactivation of a DNA fragment comprising an isoflavone *O*-methyltransferase gene under the control of a suitable constitutive or inducible promoter.

19. The method of claim 18, wherein said fragment comprises SEQ ID NO:1.

20. The method of claim 18, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

21. The method of claim 18, 19 or 20, wherein said legume is alfalfa.

22. A method for decreasing the level of at least one 4'-*O*-methylated isoflavonoid compound in a target plant having all the necessary enzymes for synthesizing said 4'-*O*-methylated isoflavonoid compound comprising transforming said target plant with a DNA fragment comprising an isoflavone *O*-methyltransferase gene to form a transgenic plant and inducing antisense expression, sense gene-mediated silencing, or nucleic acid-mediated insertional inactivation of said isoflavone *O*-methyltransferase gene under the control of a suitable constitutive or inducible promoter.

23. The method of claim 22, wherein said compound is selected from the group consisting of a 4'-*O*-methylated isoflavonoid phytoalexin, a 4'-*O*-methylated isoflavonoid phytoalexin conjugate and mixtures thereof.

24. The method of claim 22 or 23, wherein said fragment comprises SEQ ID NO:1.

25. The method of claim 22 or 23, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

26. A method for decreasing the level of at least one 4'-*O*-methylated isoflavonoid nutraceutical, at least one 4'-*O*-methylated isoflavonoid nutraceutical or mixtures thereof in a target plant having all the necessary enzymes for synthesizing said 4'-*O*-methylated isoflavonoid nutraceutical or said conjugate comprising transforming said target plant with a DNA fragment comprising an isoflavone *O*-methyltransferase gene to form a transgenic plant and inducing antisense expression or sense gene-mediated silencing of said isoflavone *O*-methyltransferase gene under the control of a suitable constitutive or inducible promoter, thereby increasing the level of the corresponding non-methylated precursor, its conjugate or mixture thereof.

27. The method of claim 26, wherein said fragment comprises SEQ ID NO:1.

28. The method of claim 26, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

29. A method for the production of a 7-*O*-methylated isoflavonoid compound comprising contacting intact plants or cell suspension cultures with a non-methylated isoflavone precursor of said 7-*O*-methylated isoflavonoid compound, said intact plants or

cell suspension cultures transformed with a DNA fragment comprising an isoflavone *O*-methyltransferase gene under the control of a suitable constitutive or inducible promoter.

30. The method of claim 29, wherein said fragment comprises SEQ ID NO:1.

31. The method of claim 29, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

32. A method for the production of a 7-*O*-methylated isoflavonoid compounds comprising contacting a soluble or immobilized isoflavone *O*-methyltransferase enzyme with a non-methylated isoflavone precursor to said 7-*O*-methylated isoflavonoid compound, wherein said enzyme is produced by the expression of a DNA fragment encoding the isoflavone *O*-methyltransferase gene in transgenic plants, transfected yeast, or transfected insect cells.

33. The method of claim 32, wherein said fragment comprises SEQ ID NO:1.

34. The method of claim 32, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

35. A method to detect 4'-*O*-methyltransferase comprising the steps of

a) preparing tissue that may have 4'-*O*-methyltransferase;

b) incubating said tissue with a first antibody that binds 4'-*O*-methyltransferase;

c) removing said antibody that did not bind to said tissue; and

d) incubating said tissue with a second antibody that binds said first antibody, said second antibody being detectably labeled.

36. A method of increasing disease resistance in a target plant by transforming said target plant with a DNA fragment comprising an isoflavone *O*-methyltransferase gene, wherein said transformed plant exhibits increased levels of at least one 4'-*O*-methylated isoflavonoid when compared to levels of said 4'-*O*-methylated isoflavonoid in plants of the same species which do not comprise said DNA fragment.

37. The method of claim 36, wherein said fragment comprises SEQ ID NO:1.

38. The method of claim 36, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

39. In a composition comprising at least one 4'-*O*-methylated isoflavonoid suitable for administration as a a foodstuff, a nutritional supplement, an animal feed supplement, a nutraceutical, or a pharmaceutical, the improvement comprising 4'-*O*-methylated isoflavonoid isolated from at least a portion of a transgenic plant transformed with a DNA fragment comprising an isoflavone *O*-methyltransferase gene, wherein said transgenic plant exhibits increased levels of said 4'-*O*-methylated isoflavonoid when compared to levels of said 4'-*O*-methylated isoflavonoid in plants of the same species which do not comprise said DNA fragment.

40. The composition of claim 39, wherein said fragment comprises SEQ ID NO:1.

41. The composition of claim 39, wherein said fragment comprises a sequence exhibiting at least moderate hybridization with SEQ ID NO:1.

42. The composition of claim 39, 40 or 41, wherein said transgenic plant is a legume.

43. A transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said transgenic plant upon expression of said gene exhibits increased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.

44. Seed from a transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said plant upon expression of said gene exhibits increased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.

45. Progeny from a transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said plant upon expression of said gene exhibits increased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.

46. Progeny from seed of a transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said plant upon expression of said gene exhibits increased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.

47. A transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said plant upon expression of said gene exhibits decreased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.

48. Seed from a transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said plant upon expression of said gene exhibits decreased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.

49. Progeny from a transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said plant upon expression of said gene exhibits decreased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.

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50. Progeny from seed of a transgenic plant comprising at least one recombinant DNA sequence encoding a portion of an isoflavone *O*-methyltransferase gene, wherein said plant upon expression of said gene exhibits decreased levels of 4'-*O*-methylated isoflavonoid compounds when compared to levels of said 4'-*O*-methylated isoflavonoid compounds in plants of the same species which do not comprise said recombinant DNA sequence.